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1of3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANTS:	Alto STEMMER et al.	CONFIRMATION NO. 6144
SERIAL NO.:	09/710,903	GROUP ART UNIT: 2174
FILED:	November 14, 2000	EXAMINER: Peng Ke
TITLE:	"METHOD FOR ALTERING A PROTOCOL IN A MAGNETIC RESONANCE APPARATUS"	

MAIL STOP APPEAL BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPELLANTS' MAIN BRIEF ON APPEAL

S I R:

In accordance with the provisions of 37 C.F.R. §1.192(a), Appellants herewith submit their main brief in support of the appeal of the above-referenced application.

REAL PARTY IN INTEREST:

The real party in interest is the assignee of the present application, Siemens Aktiengesellschaft, a German corporation.

RELATED APPEALS AND INTERFERENCES:

There are no related appeals and no related interferences.

STATUS OF CLAIMS:

Claims 1-3 are on appeal, and constitute all pending claims of the application, and all claims as originally filed. No claim was cancelled during earlier prosecution.

STATUS OF AMENDMENTS:

No Amendment has been filed following the final rejection.

SUMMARY OF THE INVENTION:

The pulse sequences utilized in imaging magnetic resonance technology (MRI) and in the magnetic resonance spectroscopy (NMR spectroscopy) are

normally parameterizable. (p. 1, l. 12-14) Parameters are offered to the operator by means of which the operator selects the anatomy that is of interest(e.g. number, position, orientation of the slices), or influences the contrast between the relevant tissue (e.g. T1/T2 contrast via TR/TE parameters, pre-saturation pulses for fat/water suppression), or selects the resolution depending on the size of the significant objects (e.g. FoV, matrix size, layer thickness), or influences the signal-to-noise ratio of the resulting images (e.g. averages, bandwidth), or controls the measuring time (e.g. TR, TE, concatenations, averages), etc.. (p. 1, l. 14-21) Generally, the values of these parameters cannot be selected independently of one another. (p. 1, l. 21-22) There are numerous dependencies between the individual parameters (for example, TR and the number of the slices), which generally are different for different sequence types. (p. 1, l. 22-24) Moreover, the parameter values are subject to further boundary conditions, which, for example, are determined by the efficiency of the utilized hardware (e.g. maximum amplitude and minimum rise time of the gradient system) and the load capability of the patient (e.g. physiological stimulation threshold given rapidly varying magnetic fields). (p. 1, l. 24 – p. 2, l. 2)

A difficulty for the dialog system of a MR scanner is to support the user with respect to finding a parameter set (called a protocol), which meets the operator's requirements and which can be implemented with the present hardware. (p. 2, l. 3-5)

Conventionally, the user selects a protocol from a set of stored, predetermined protocols, each protocol being optimized for a particular investigation. (p. 2, l. 6-7) If parameters must be adapted (normally, this is the case at least for the parameters for selecting the anatomy), only values by means of which the protocol remains intact as a whole, with unchanged values of all other parameters, are

offered to the operator/user for each single parameter P_i. (p. 2, l. 7-11) The advantage of this approach is that the suitability of the protocols for their intended purpose cannot be degraded by the "over-adjustment" by user. (p. 2, l. 11-13) As a result of the aforementioned dependency between the parameters, the value range A_i of the parameter P_i generally depends on the value of the other parameters P_j ($j \neq i$). (p. 2, l. 13-15) If the user does not see a see a desired value offered in the selected protocol, it is theoretically possible to select the desired value subsequent to the modification of one or more other parameters. (p. 2, l. 15-17) For this purpose, however, the user needs detailed knowledge about the dependencies between the parameters, which is a disadvantage. (p. 2, l. 17-19)

The claims on appeal concern a method for altering a protocol in a magnetic resonance apparatus which allows an operator to set a parameter to a desired value, which causes at least one other parameter value to change, without the necessity of the operating having to proceed through several steps to determine the effect of setting the parameter to the desired value. (p. 2, l. 21 – p. 3, l. 2)

This is achieved in a method for selecting a protocol in a magnetic resonance apparatus wherein the value range A_i of the parameter P_i offered to the user is automatically extended by the measuring system to encompass values that take modifications of other parameters into consideration. The extended adjustment possibilities are offered to the user. If the operator selects a value in the extended value range, the operator is automatically informed (i.e., without the necessity of further operator invention or action) about the necessary adaptations of the dependent parameters (e.g. by means of a pop-up dialog). In particular, the operator can be given the opportunity to reject the adaptation (and therefore the changed

value of parameter P_i). It should be noted that a hidden adaptation of the dependent parameters by the system is generally not expedient. Whether the suggestions calculated by the system can be accepted usually depends on the specific examination. (p. 3, l. 3-14)

As used herein and as explicitly stated in the present specification, the term "magnetic resonance apparatus" encompasses both imaging and spectroscopic systems operating based on nuclear magnetic resonance principles. (p. 3, l. 15-17)

The two immediately following sections concern a typical situation which arises in the preparation of an MR protocol. The operator would like to measure 12 slices, however, the current TR value (300 ms) only allows 10 slices at a maximum. The section "User Action Without Invention" describes the steps necessary for this purpose which would be undertaken by an experienced MR operator working with a conventional system. The section "User Action With the Invention" describes the same scenario with respect to a MRease system (MRease is the commercially available control software of Siemens MR scanning). (p. 5, l. 5-12)

The next section describes an exemplary embodiment for a possible software-oriented realization of the inventive method. (p. 5, l. 12-13)

Figure 1 shows a section of a conventional user interface in which the measuring parameters can be adjusted. The parameter field "Slices" has been selected by the operator. Subsequently, the value range of the parameter is visualized in the lower range. The parameter can be freely set in the range between 1 and 10 - without other parameters having to be adapted as a result (known approach). The value desired by the operator (slices = 12) is not present. The

operator must know that the value of TR must be increased in order to be subsequently able to enter the desired value for "slices". (p. 5, l. 14-21)

For this purpose, the operator selects the parameter TR (Figure 2). (p. 5, l. 22)

The operator does not know the minimal TR value, which is necessary for increasing the "slices" up to 12 slices. Therefore, the operator initially will select a very high value (here TR = 3000ms) for which the operator is certain that 12 slices are possible. Then, the operator changes over to the parameter field "slices" again (Figure 3). As can be seen, the TR value is lengthened vis-a-vis Figure 1. (p. 6, l. 1-5)

Now, the operator could even increase the value of "slices" up to 108. The operator sets the number of the slices to the desired value 12. The operator must now change over to the parameter TR and must set its value to the new minimum (here 332 ms, see Figure 4). This is necessary, so that the measuring time is not unnecessarily lengthened and so that a similar contrast is received as in the initial protocol. (P. 6, l. 6-10)

User Interaction with Invention

Figure 5 shows a section of the MRease user interface in which the measuring parameters can be adjusted. The parameter field "slices" has been selected by the user. Subsequently, the value range of the parameter is visualized in the lower range. The parameter can be freely set in the range between 1 and 10 - without other parameters having to be adapted as a result. This parameter range can be for example, green in the range display. On the right side of it (between 11 and 28), the extended value range follows for example, in (red). (p. 6, l. 11-18)

The operator can directly enter the desired value “slices” = 12. As a result of the parameter input in the extended value range, a modal dialog pops up, which informs the operator about the necessary parameter adaptation (here an extension of TR by 32 ms, see Figure 6). (p. 6, l. 19-22)

The operator can accept this adaptation (by actuating the button command “OK”) or can reject it (by actuating “Undo” in the button command). If the operator accepts the adaptation, the operator arrives at the same protocol (“slices” = 12, TR = 332 ms) as at the end of the scenario “User Interaction Without Invention”. In the “undo” case, the original value (slices = 2, TR = 300ms) remains. (p. 6, l. 23 – p. 7, l. 3)

Realization details

In sequence diagrams, Figures 7, 8 and 9 show the cooperation between the operator and the relevant software components during the above described scenario using the inventive method. (p. 7, l. 4-7)

Sequence diagrams serve the purpose of representing the chronological sequence of the communication between the involved components. In each diagram, time runs from the top to the bottom. (p. 7, l. 8-10) The relevant components are shown by perpendicular (here broken) life lines. If the life line is covered by a wide perpendicular bar, this means that the component is active in the corresponding time interval. If such a bar is covered by a further laterally offset bar, this indicates a recursive or iterative action. (p. 7, l. 10-14) Messages between the individual components are represented by horizontal arrows between the life lines. The answer to a message is represented as a separate arrow (reversed direction). A condition in square brackets on an arrow means that the message (and therefore

the appertaining answer as well) is sent only when the condition is fulfilled. A component can be the sender or receiver of a message. (p. 7, l. 14-18)

Apart from the operator, the diagrams of Figures 7, 8 and 9 differentiate between the components "user interface", "protocol access component" and "sequence". The user interface is the part of the software with which the user directly communicates. The component sequence represents the portions of the software, which realizes a specific physical measuring method (e.g. spin-echo-sequence, turbo-spin-echo-sequence, etc.). (p. 7, l. 19-24) Generally, each of these measuring methods can have individual dependencies between the parameters. (p. 7, l. 24 – p. 8, l. 1) The other software components user interface, protocol access components do not "know" which measuring method is realized in the current constellation (and therefore the current parameter dependencies). (p. 8, l. 1-3) The other software components merely know a set of standardized entry points in the sequence. Therefore, the sequence can be replaced by any software module which makes these entry points available. (p. 8, l. 3-6) The protocol access component is a software layer, which is situated between the user interface and the actual protocol data. Upon request, the protocol access component supplies parameter data to the user interface and may modify (in turn, upon request of the user interface) the protocol data. (p. 8, l. 6-9) A communication with the sequence is necessary therefor, particularly for determining the value range and the dependencies. The user interface does not directly communicate with the sequence. (p. 8, l. 9-12)

Messages that are exchanged between the components during the above described scenarios are described in the following. The individual messages are

referenced by their number in the sequence diagrams of Figures 7, 8 and 9. (p. 8, l. 13-15)

ISSUES:

The following issues are the subject of the present appeal:

(1) Whether the subject matter of claims 1 and 2 is anticipated by United States Patent No. 5,594,849 (Kuc et al.) under 35 U.S.C. §102(b);

(2) Whether the subject matter of claim 3 would have been obvious to a person of ordinary skill in the art under the provisions of 35 U.S.C. §103(a) based on the teachings of Kuc et al. in view of United States Patent No. 6,366,834 (Hayes et al).

GROUPING OF CLAIMS:

The patentability of claims 1 and 2 stands or falls together. The patentability of claim 3 is independent of the patentability of claims 1 and 2, and separate arguments are presented below concerning the patentability of claim 3.

ARGUMENT:

The Kuc et al. reference discloses an apparatus for obtaining biomagnetic signals, from which a biomagnetic image of an organism is then generated. For generating this image, it is necessary to know the location and the magnitude of current sources (dipoles) within the organism. This is determined by modeling the electro-physiological activities of the organism, based on detection of extremely weak magnetic fields disposed outside of the organism. These extremely weak magnetic fields are measured or detected with devices known as SQUIDs (Superconducting Quantum Interference Devices). The location and magnitude of the dipole current sources are then reverse-calculated based on the magnetic field pattern.

First and foremost, therefore, the Kuc et al reference is not a magnetic resonance apparatus and has nothing to do with obtaining magnetic resonance data, as explicitly required in claim 1 of the present application. A magnetic resonance apparatus, wherein magnetic resonance data are obtained, is a well known medical imaging modality, the basic components and operation of which are well known to those of ordinary skill in the art. The terms "magnetic resonance apparatus" and "obtaining magnetic resonance data" therefore have a well understood meaning, as was explicitly referenced at page 3, lines 15-17 of the present specification.

The apparatus disclosed in the Kuc et al reference is incapable of acquiring magnetic resonance data, as that term is commonly understood, and has nothing whatsoever to do with the physical phenomenon of magnetic resonance. This is not an issue of the Examiner giving the claim language its broadest reasonable interpretation, as Appellants acknowledge the Examiner is required to do. Magnetic resonance is a well understood and well known phenomenon, and the techniques for acquiring magnetic resonance data are equally well known. There is absolutely no basis in fact to contend that the Kuc et al reference has anything whatsoever to do with magnetic resonance, and therefore there is no basis to "interpret" the term "magnetic resonance" as having any relationship whatsoever to the disclosure of the Kuc et al reference.

It is also clear that the Examiner lacks a basic understanding of the phenomenon of magnetic resonance. When the fact that the Kuc et al reference has nothing whatsoever to do with magnetic resonance data acquisition was pointed out to the Examiner during prosecution, the Examiner responded, in the final rejection, by stating that Kuc et al teach "a magnetic resonance apparatus that picks a

magnetic field generated by a source of a living body (column 7, lines 1-18), and this apparatus is manipulated by a control unit (column 7, lines 1-18)." The Examiner appears to believe that acquiring magnetic resonance data has something to do with detecting a magnetic field, however, this is completely incorrect and demonstrates that the Examiner does not even have a fundamental understanding of the basics of magnetic resonance data acquisition. Although magnetic fields are generated in order to allow the magnetic resonance data to be obtained, obtaining the magnetic resonance data is accomplished by detecting an RF signal that is emitted by processing nuclear spins. Magnetic resonance data are *not* acquired in any manner by detecting or measuring a magnetic field.

For this reason alone, it is therefore clear that the Kuc et al reference does not disclose all of the elements of claim 1, as arranged and operating in that claim. It is possible that the Examiner may contend that the techniques disclosed in the Kuc et al reference, despite being related in the Kuc et al reference to the operation of a magnetic field measuring device, could be applicable to the different purpose of acquiring magnetic data. If so, this would be a completely different rejection (under 35 U.S.C. §103(a) rather than under 35 U.S.C.§102(b)), and would require evidentiary substantiation. Even if this is the true position of the Examiner, this position is traversed by the Appellants, for the reasons discussed below in connection with the rejection under Section 103(a) based on Kuc et al and Hayes et al.

In addition to the fact that the Kuc et al reference has nothing whatsoever to do with obtaining magnetic resonance data, the protocol disclosed in the Kuc et al

reference is completely unrelated to the protocol disclosed in claims 1 and 2 on appeal, even in general terms.

The apparatus disclosed in the Kuc et al. reference is solely for the purpose of allowing a physician or technician to review or manipulate, such as by enlargement, the *already acquired* data representing the magnetic fields and the dipoles that have been reverse-calculated therefrom.

This is in contrast to the operation of a magnetic resonance imaging apparatus set forth in claim 1, wherein the method of claim 1 is for the purpose of selecting parameters that are used in the *acquisition* of the data. The method set forth in claim 1 of the present application is implemented before any data are acquired using the magnetic resonance apparatus, and is for the purpose of providing a visual indication at a display as to how the selection or modification of one parameter in the data acquisition protocol will change another parameter in that protocol. By contrast, the apparatus and operating method disclosed in the Kuc et al. reference do not have any influence whatsoever as to the manner by which the data are acquired. The apparatus and method disclosed in the Kuc et al. reference are strictly for the purpose of post-processing data that have already been acquired, and have no influence whatsoever on the manner by which the data are acquired in the first place.

The passages cited by the Examiner in the Kuc et al. reference merely refer to various types of manipulations, such as enlargements or repositioning, of images corresponding to, or represented by, data that have already been acquired. These manipulations have nothing to do with the data acquisition itself.

Claim 1 on appeal explicitly states that the protocol claimed therein is a protocol that is used to actually obtain the magnetic resonance data (as opposed to some sort of post-processing protocol.

In addition to the fact that acquiring a magnetic field pattern using a SQUID bears no resemblance whatsoever to detecting magnetic resonance signals using a magnetic resonance apparatus, the fundamental difference described above between the subject matter of the present application and the apparatus and method disclosed in the Kuc et al. reference is clearly demarcated by the aforementioned language in claim 1.

The Kuc et al. reference, therefore, does not disclose all of the method steps of independent claim 1 as arranged and operating in that claim, and therefore does not anticipate claim 1. Claim 2 further defines one of the method steps in the novel method of claim 1, and therefore is not anticipated by the Kuc et al. reference for the same reasons discussed above in connection with claim 1.

The above discussion also pertains to the obviousness rejection of claim 3, based on the teachings of the Kuc et al. reference, further in view of the teachings of Hayes et al. From the above discussion, it should be clear that even if the Kuc et al. reference were (or could be) modified in accordance with the teachings of Hayes et al., a method as set forth in claim 3, which embodies the subject matter of claim 1 therein, still would not result. In the context of this obviousness rejection, moreover, Applicants respectfully submit that the differences and disparities between a magnetic resonance imaging apparatus and an apparatus which detects magnetic fields using SQUIDs are so fundamental that a person of ordinary skill in the field of magnetic resonance imaging would have no reason whatsoever to consult a device

employing SQUIDs in order to obtain any useful information relating to the operation of a magnetic resonance imaging apparatus. If a person of ordinary skill in the field of magnetic resonance imaging did have the insight to seek or use information relating to a device employing SQUIDs, this would be an insight supporting patentability, rather than negating patentability.

Therefore, the subject matter of claim 3 would not have been obvious to a person of ordinary skill in the field of magnetic resonance imaging, based on the teachings of Kuc et al. and Hayes et al.

CONCLUSION:

For the foregoing reasons, Appellants respectfully submit that the Examiner is in error in fact and in law in rejecting claims 1 and 3 of the present application. Reversal of the rejections is therefore justified, and the same is respectfully requested.

This Appeal Brief is accompanied by a check for the requisite fee in the amount of $330.00.

Submitted by,

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CERTIFICATE OF MAILING

I hereby certify that an original and two copies of this correspondence are being deposited with the United States Postal Service as First Class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on February 2, 2004.

Steven H. Noll

STEVEN H. NOLL

APPENDIX "A"

1. A method for altering a protocol in a magnetic resonance apparatus comprising the steps of:

(a) displaying a display presentation at a user interface for a magnetic resonance apparatus containing a first parameter in a protocol for operating the magnetic resonance apparatus to obtain magnetic resonance data and a second parameter in said protocol for operating the magnetic resonance apparatus;

(b) in said display presentation, showing a range of values for said first parameter including designating a first sub-range within said range wherein selection of a value does not modify said second parameter, and a second sub-range within said range wherein selection of a value causes modification of said second parameter;

(c) if a value for said first parameter is selected in said second sub-range, automatically showing in said display presentation how the value selected for said first parameter will modify said second parameter; and

(d) giving a user an option in said display presentation to confirm selection of said value selected for said first parameter or to reject selection of said value selected for said first parameter, via said user interface.

2. A method as claimed in claim 1 wherein step (c) comprises automatically showing how the value selected for said first parameter will modify said second parameter in a pop-up dialog within said display presentation.

3. A method as claimed in claim 1 wherein step (b) comprises designating said first sub-range with a first color in said display presentation and designating said second sub-range with a second color in said display presentation.

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FIG. 1
(PRIOR ART)

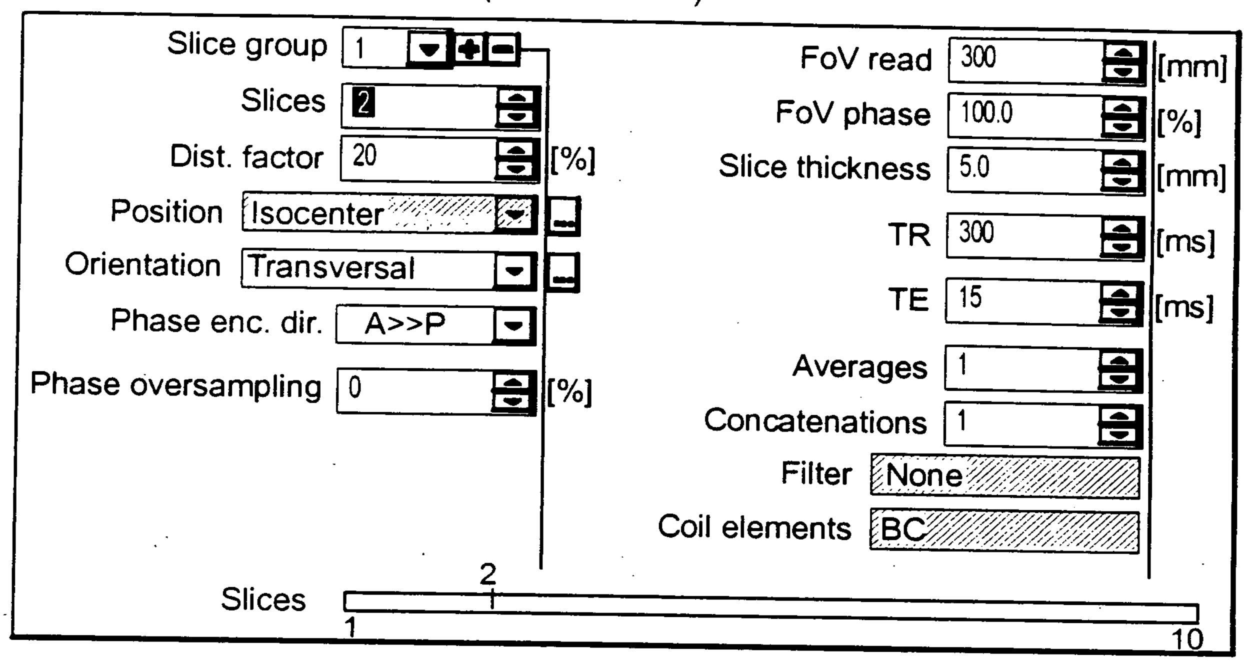


FIG. 2
(PRIOR ART)

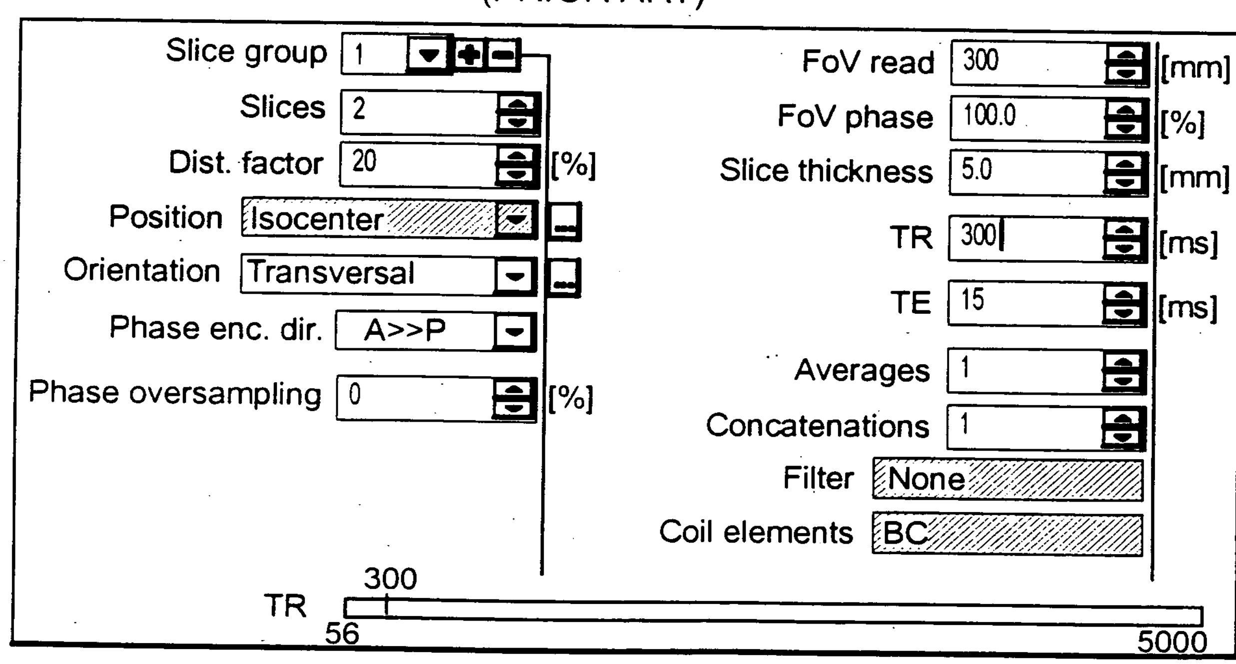


FIG. 3
(PRIOR ART)

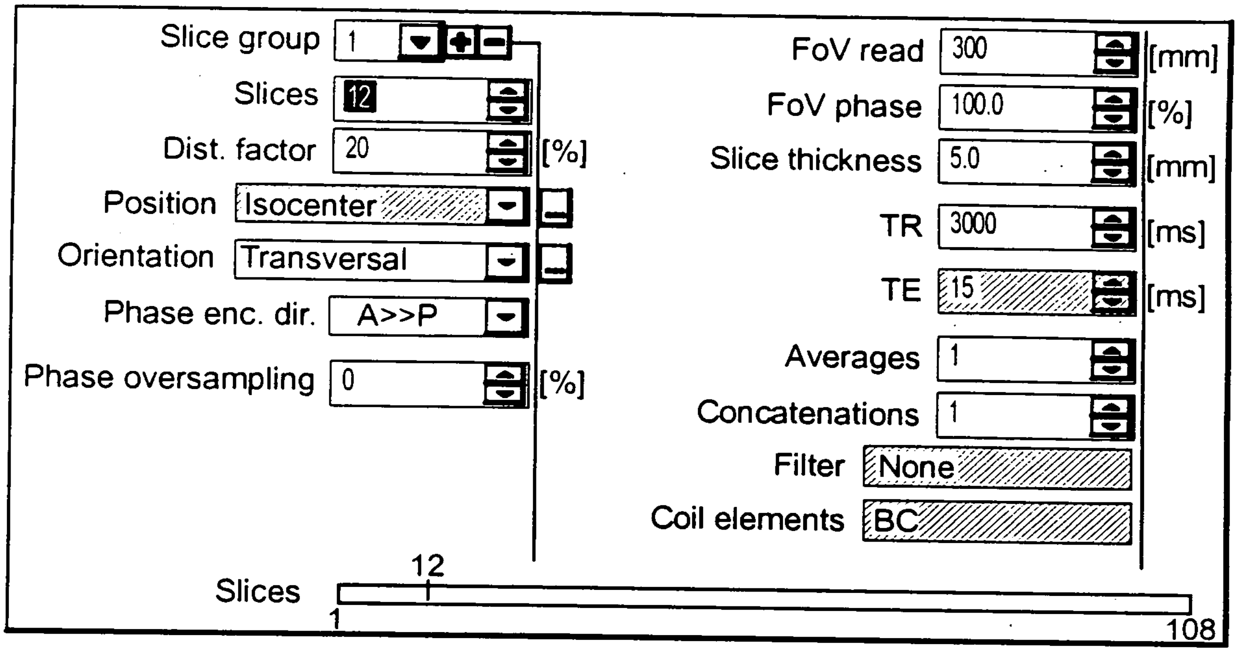


FIG. 4
(PRIOR ART)

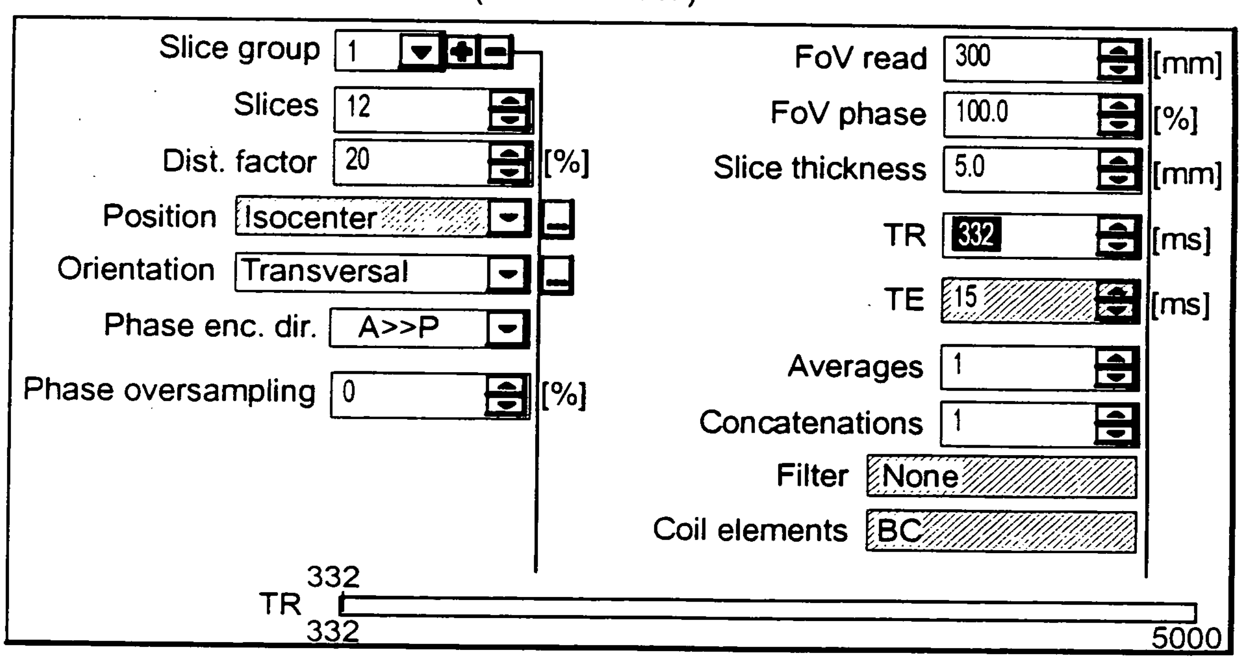
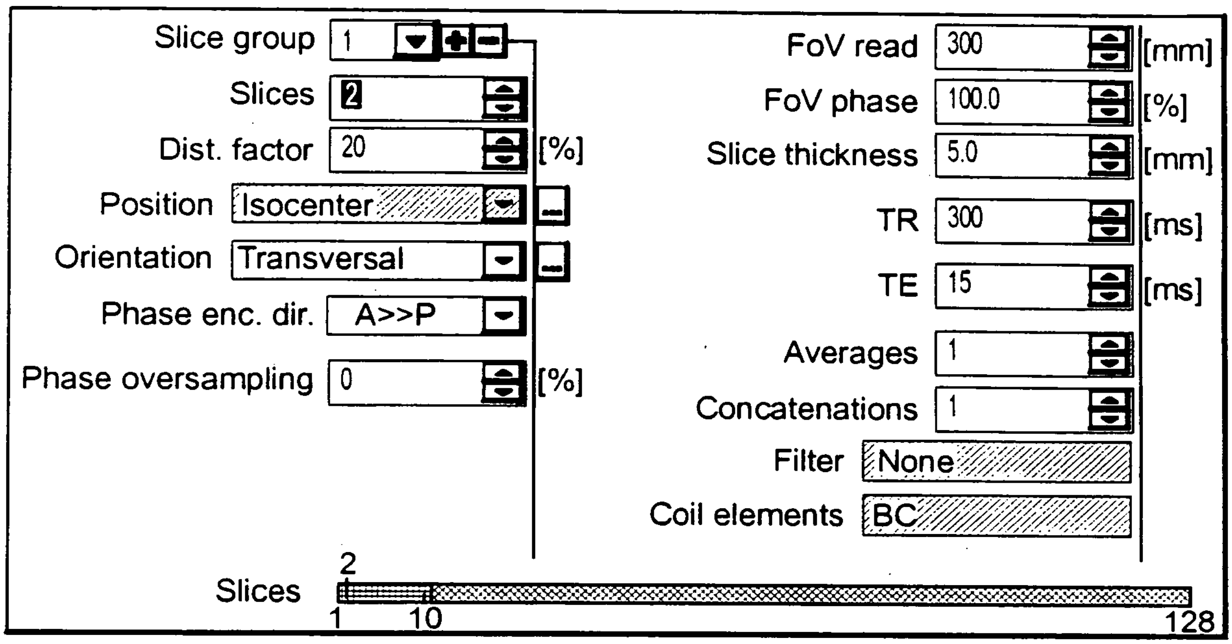


FIG. 5


Slice group
1
Slices
2
Dist. factor
20
[%]
Position
Isocenter
Orientation
Transversal
Phase enc. dir.
A>>P
Phase oversampling
0
[%]
FoV read
300
[mm]
FoV phase
100.0
[%]
Slice thickness
5.0
[mm]
TR
300
[ms]
TE
15
[ms]
Averages
1
Concatenations
1
Filter
None
Coil elements
BC
Slices
2
1
10
128

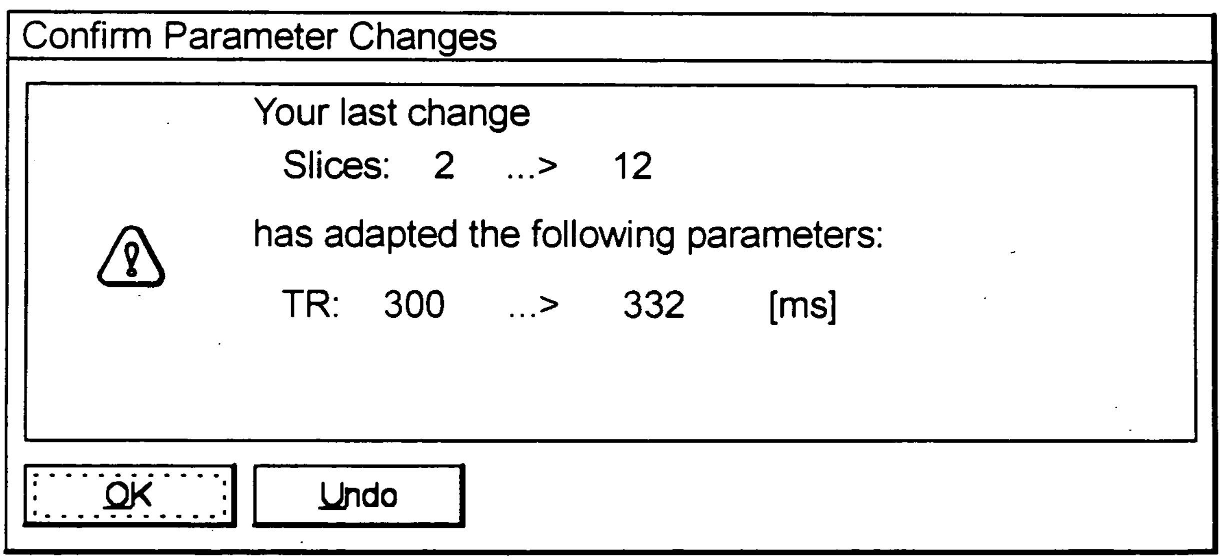

Confirm Parameter Changes
Your last change
Slices: 2 ...> 12
has adapted the following parameters:
TR: 300 ...> 332 [ms]
OK
Undo

FIG. 6

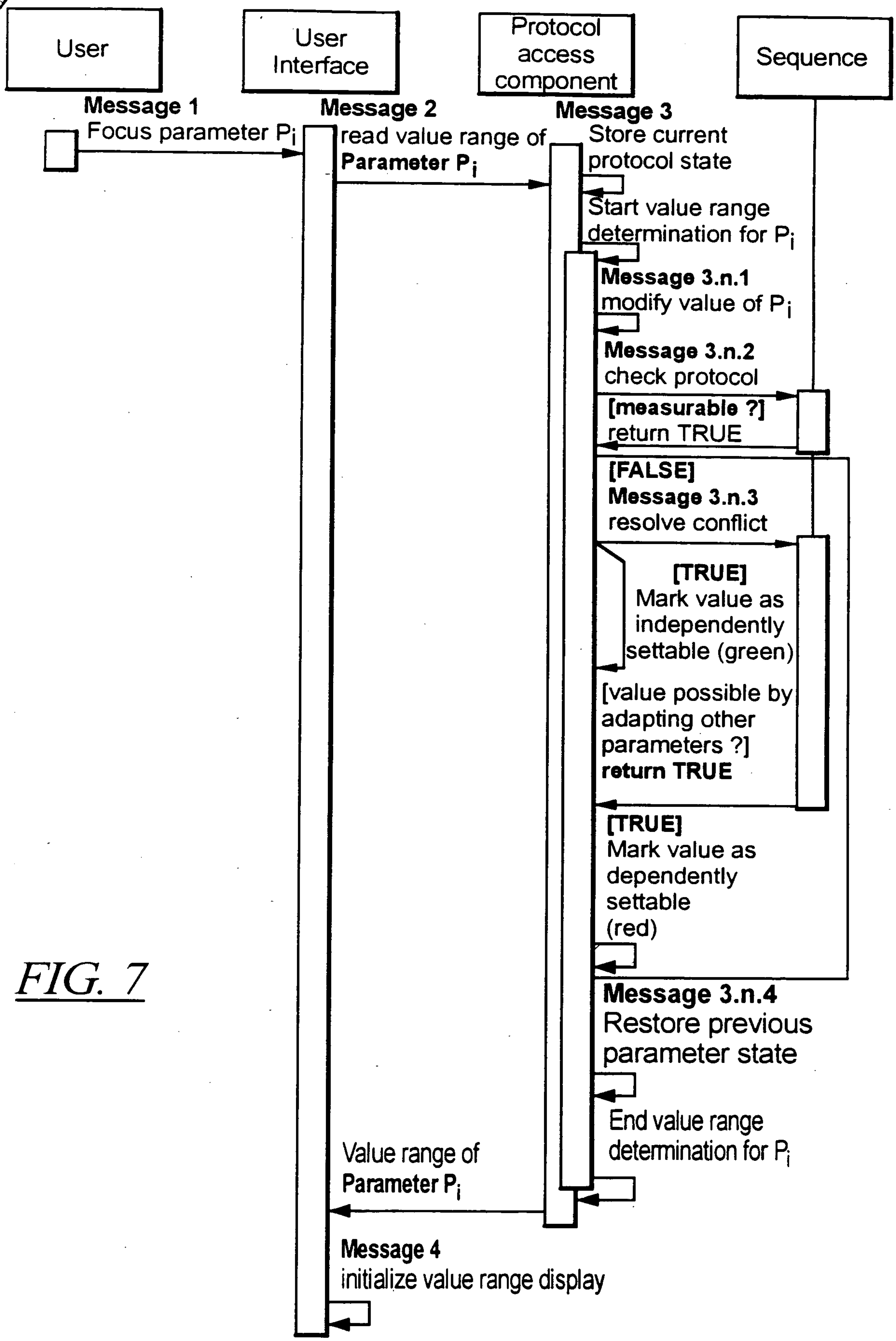

User
User Interface
Protocol access component
Sequence
Message 1
Focus parameter P_i
Message 2
read value range of
Parameter P_i
Message 3
Store current protocol state
Start value range determination for P_i
Message 3.n.1
modify value of P_i
Message 3.n.2
check protocol
[measurable ?]
return TRUE
[FALSE]
Message 3.n.3
resolve conflict
[TRUE]
Mark value as independently settable (green)
[value possible by adapting other parameters ?]
return TRUE
[TRUE]
Mark value as dependently settable (red)
Message 3.n.4
Restore previous parameter state
End value range determination for P_i
Value range of
Parameter P_i
Message 4
initialize value range display

FIG. 7

FIG. 8

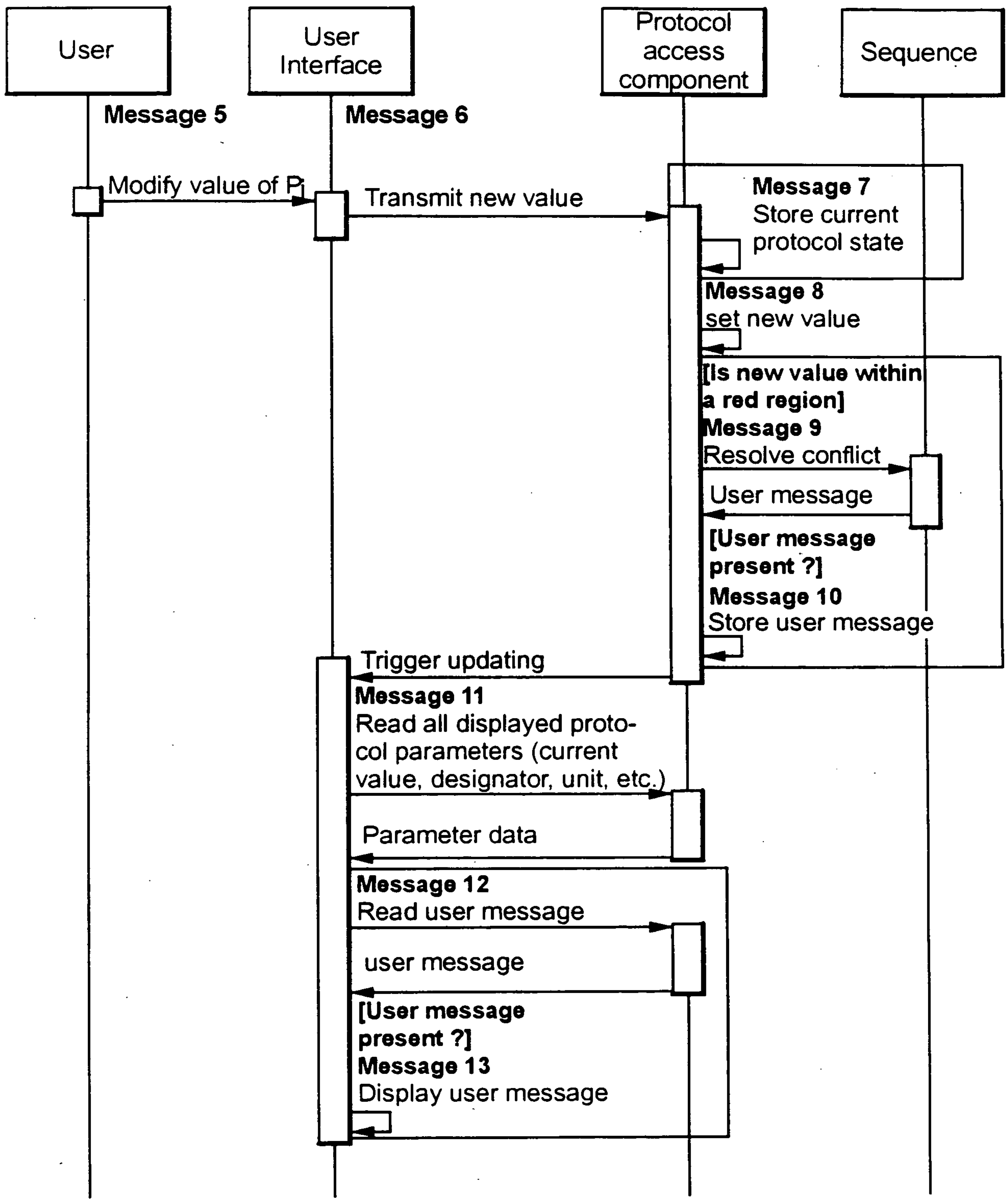
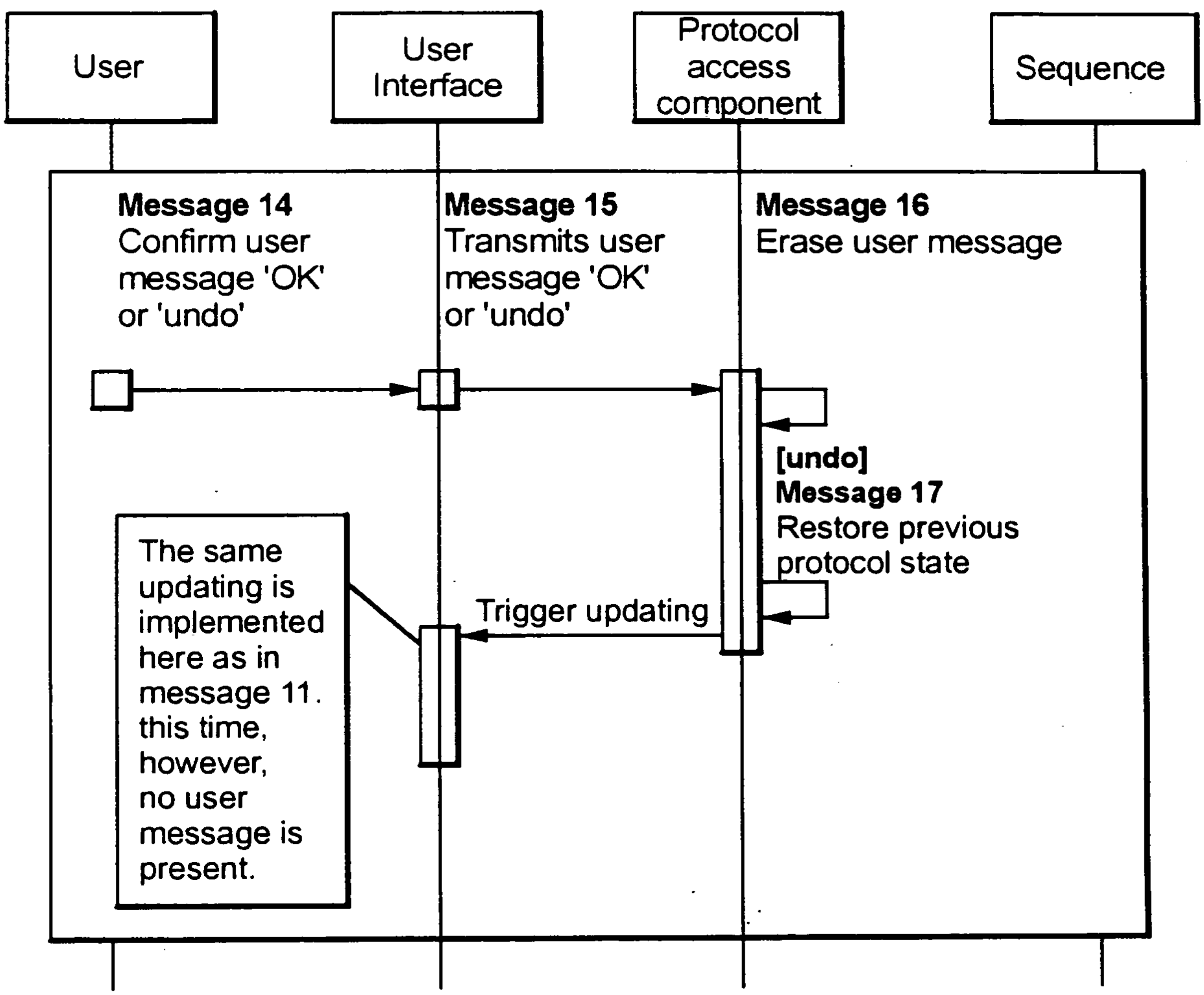

User
User Interface
Protocol access component
Sequence
Message 5
Message 6
Modify value of P
Transmit new value
Message 7
Store current protocol state
Message 8
set new value
[Is new value within a red region]
Message 9
Resolve conflict
User message
[User message present ?]
Message 10
Store user message
Trigger updating
Message 11
Read all displayed protocol parameters (current value, designator, unit, etc.)
Parameter data
Message 12
Read user message
user message
[User message present ?]
Message 13
Display user message

FIG. 9


User
User Interface
Protocol access component
Sequence
Message 14
Confirm user message 'OK' or 'undo'
Message 15
Transmits user message 'OK' or 'undo'
Message 16
Erase user message
[undo]
Message 17
Restore previous protocol state
Trigger updating
The same updating is implemented here as in message 11. this time, however, no user message is present.